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Technical Report:

Environmental Noise Assessment a first floor two-bedroom flat at Unicorn House, Station Road West, Stowmarket IP14 1ES

Project Ref: 10826

Environmental Noise Assessment

Date of Issue:	26th January 2024
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1. Executive Summary

1.1. dB Consultation Limited (dBC) were commissioned by Steven R Francis of Woodbridge Building Services Ltd. to provide an environmental noise assessment to satisfy condition 4 of planning decision DC/23/05196 for the proposed dwelling at Unicorn House, Station Road West, Stowmarket IP14 1ES.

1.2. On-site monitoring of ambient noise levels was conducted on the property boundary of Unicorn House with the B1115, Station Road West, P1, between 10:40 and 11:40 on 18 January 2024. The average ambient noise level at P1 was $L_{\mathrm{Aeq},5min}$ 70dB this level was used to determine internal ambient noise levels (IANL) in bedroom 1 of the development.

1.3. The ambient noise levels were measured on the first floor of the proposed new dwelling, P2, between the 18th and 23rd January 2024. The average daytime 07:00 – 23:00 IANL was $L_{\mathrm{Aeq},16hr}$ 41dB and the night-time 23:00 – 07:00 was $L_{\mathrm{Aeq},8hr}$ 34dB. These levels were used to determine any required enhancement to the sound insulation of the building's front façade to meet BS 8233 acoustic criteria.

1.4. The acoustic environment was dominated by Station Road West and the junction with Bury Street and Market Place.

1.5. Using guidance outlined in ProPG Planning and Noise guidance, the external measured noise levels place the development between medium and high risk categories meaning the development requires good acoustic design to sufficiently mitigate the potential effects of noise and allow residents comfortable living conditions with regards to external noise.

1.6. To meet the BS 8233:2014 and Pro PPG acoustic criteria for IANL the existing side windows that will form the bedroom windows of the dwelling do not need to be enhanced.

1.7. To meet the BS 8233:2014 acoustic criteria for IANL in the proposed living room the existing front windows, standard double glazing (4mm glass/20mm air/4mm glass), should be enhanced with secondary glazing with the minimum specification shown in Table 7 page 14 should be installed.

1.8. The existing and enhancement to the front façade glazing will be non-openable and should provide significant mitigation against external road traffic and commercial noise e.g. Queens Head beer garden.

1.9. dBC has provided minimum specification for background ventilation options for the proposed dwelling. Although a full ventilation scheme should be provided by others to ensure compliance with Building Regulations.

1.10. No further mitigation measures are required for this development.

2. Introduction

2.1. Planning decisions DC/23/02203 and DC/23/05196 permits the change of use from a bakery and hot food take away, with associated external and internal alterations, to a two-bedroom residential flat on the first floor of Unicorn House, Station Road west, Stowmarket IP14 1ES.

2.2. The site is located adjacent to Station Road West and approximately 18m from the junction with Bury Street. Mid Suffolk District Council have requested an environmental noise assessment for the proposed dwelling to ensure compliance with the acoustic criteria for new dwellings in BS 8233:2014.

2.3. Steven Francis of Woodbridge Building Services Ltd. commissioned dB Consultation Limited to undertake the assessment.

2.4. The full report will satisfy the requirements of condition 4 of planning decision DC/23/05196.

2.5. The report was written by Samantha Riley of dB Consultation Limited (dBC), a practicing acoustician for over 24 years, Full Member of the Institute of Acoustics (MIOA) and experienced in noise assessment in many industrial and commercial sectors.

2.6. The report has been reviewed by Mick Lane, Acoustic Director at dB Consultation Limited, a practicing acoustician for over 17 years, Full Member of the Institute of Acoustics (MIOA) and experienced in noise assessment in many industrial and commercial sectors.

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3. Standards / References / Assessment Criteria

Noise Policy Statement for England (NPSE) March 2010

3.1. The NPSE sets out the long-term vision of the Government's policy on noise, which in essence is to promote good health and a good quality of life through the effective management of noise within the context of Government Policy on sustainable development.

3.2. The NPSE outlines three aims for effective management and control of environmental, neighbourhood and neighbour noise:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimize adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health & quality of life.*

3.3. In its aims, the NPSE uses key phrases "significant adverse" and "adverse" and these are related to the following terms which are currently being applied to noise impacts.;

- *NOEL – No Observed Effect Level – this is the level below which no effect can be detected or measured,*
- *LOAEL – Lowest Observed Adverse Effect Level – which is the level above which adverse effects on health and quality of life can be detected; and*
- *SOAEL – Significant Observed Adverse Effect Level – which is the level above which significant adverse effects on health and quality of life occur.*

3.4. The NPSE notes that it is not possible to have a single objective noise-based measure that defines SOAEL that would be applicable in all situations, consequently the NOEL, LOAEL and SOAEL are likely to change for the location, noise type and times. It is the acoustician who should identify relevant SOAEL levels taking into account the noise source exposures and receptors.

Pro PPG Planning And Noise May 2017

3.5. Note 3 Page 13 states *'In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB LAmax,F more than 10 times a night'.*

<u>*BS 8233:2014 Sound Insulation and Noise Reduction for Buildings*</u>

3.6. This standard uses the results of research and experience to provide information on the design of buildings to result in suitable internal acoustic environments appropriate for their functions. It includes controlling the noise from outside the building, noise from plant and services within it and room acoustics for non-critical situations.

3.7. The main changes in this latest version of BS 8233 were made to include revisions to Building Regulations Approved Doc E, the publication of the National Planning Policy Framework in 2012 removal of documents such as PPG24, and most importantly a reappraisal of the targets for various classes of living spaces following various research findings.

3.8. Section 5.2 states that 'when planning permission is sought for a new building or a change of use to an existing building, the local authority may grant permission, with or without conditions regarding noise levels so that local or national policies are met'.

3.9. Paragraph 6.3.2 states: 'It should be noted that for a jet aircraft the frequency content of noise when landing is generally different from that when departing. Typically, landing jet aircraft produce relatively higher levels of high frequency noise and departing jet aircraft produce relatively higher levels of low frequency noise'. This report will consider taking off noise as a worst-case scenario.

3.10. Section 7.7.2 provides a desirable level for the internal ambient noise levels for dwellings which have been included in the table below.

Activity	Location	Time Period	
		07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16h}$	-
Dining	Dining Room/Area	40dB $L_{Aeq,16h}$	-
Sleeping	Bedroom	35dB $L_{Aeq,16h}$	30dB $L_{Aeq,8h}$

Table 1: Excerpt of BS 8233:2014 Table 4 – Indoor Ambient Noise Levels for Dwellings.

3.11. Note 5 of this section states that 'If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level". If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment'.

3.12. Section 7.7.3.2 refers to the design criteria for external areas such as gardens and patios. For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

Mid Suffolk District Council

4. PRE COMMENCEMENT ACTION REQUIRED: REQUIRED NOISE LEVELS WITHIN DWELLING Prior to commencement of the hereby approved conversion to the dwelling a scheme demonstrating the achievement of the below noise standards including details of proposed glazing and alternative ventilation to support any mitigation if required, shall be submitted to the Local Planning Authority for their written approval. The dwelling shall be constructed to provide sound insulation against external noise levels to achieve internal noise levels not exceeding 30 dB LAeq (night) and 45 dB LAmax (measured with F time weighting) for bedrooms, and 35 dB LAeq (day) for other habitable rooms, with other means of ventilation provided if windows are required to be shut to meet these levels. The scheme shall take account of the proposed dwelling's location, proximity to the road and employment area (and thus predicted exposure to likely traffic noise) when making this assessment. The conversion will then be carried out in accordance with the approved scheme and shall be provided in full prior to first occupation.

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4. Site Description

4.1. The proposed conversion from commercial to residential use is located in Stowmarket town centre adjacent to Station Road West, a single carriageway (30mph) road and approximately 18m from the junction with Bury Street. The acoustic environment was dominated by local road traffic, the traffic lights walk signal and footfall.

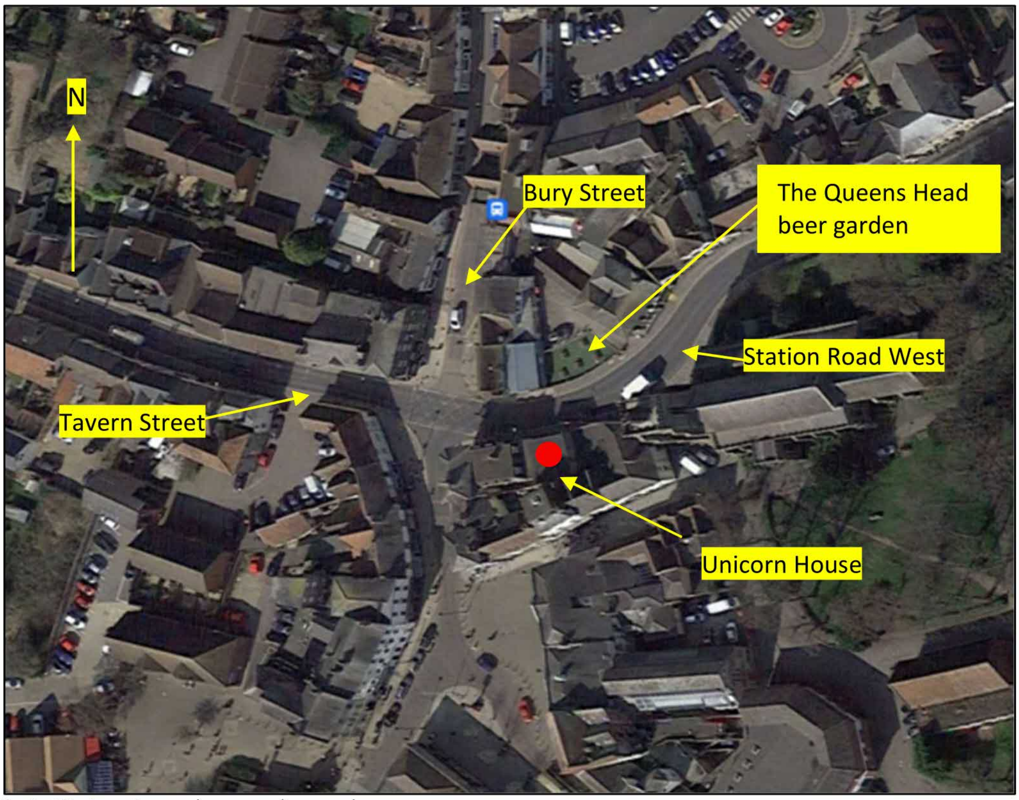

Fig. 1: Site Location and surrounding roads.

4.2. During the site visits it was noted the walking signal sounded frequently and vehicles stopped directly in front of Unicorn House.

4.3. Fig. 1 shows the location of Unicorn House marked in red, the surrounding roads, road junction and The Queens Head beer garden. The road elevation increases towards The Queens Head and the beer garden is not screened from the first floor of Unicorn House.

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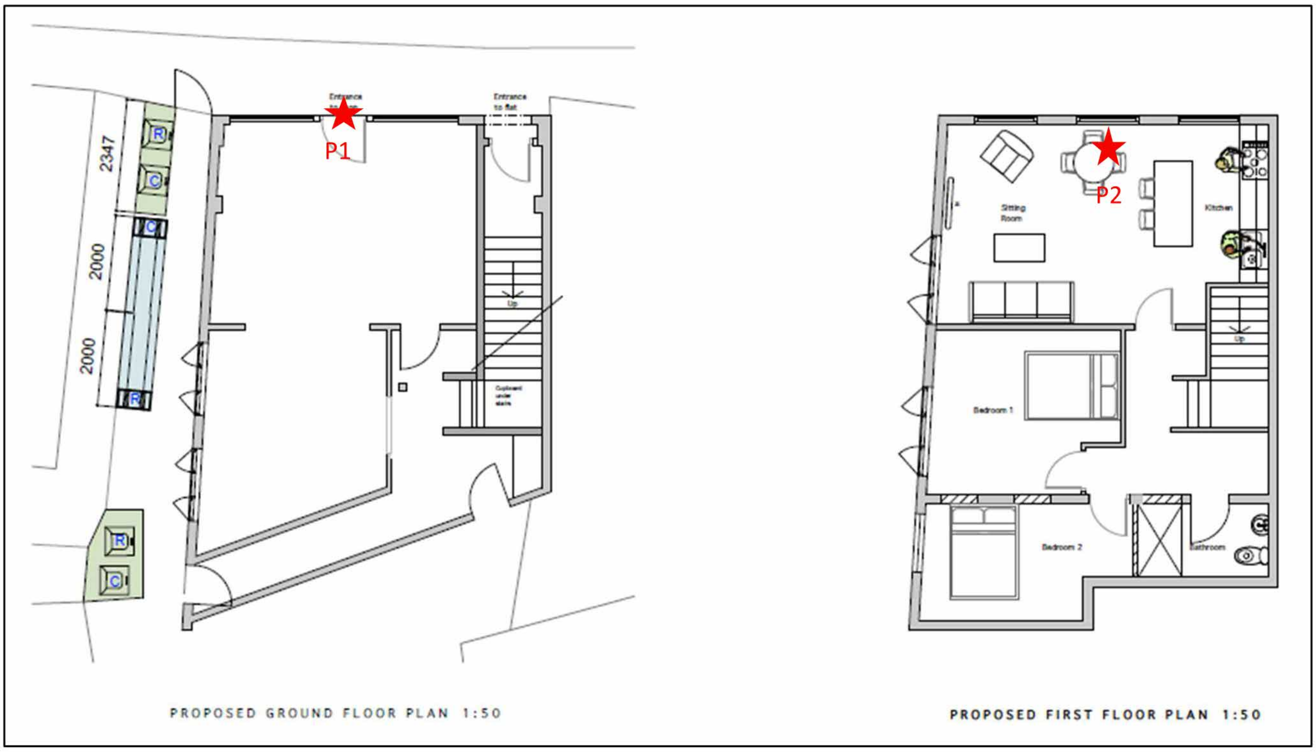


Fig. 2: Site location outlined in red.

4.4. Fig. 2 shows the external ground floor monitoring, location P1 and the first-floor internal monitoring location P2.

4.5. Fig. 3 show the proposed first floor flat, with the assessed living room shaded blue and bedroom 1 shaded green. Both excerpts from drawing number 02A.

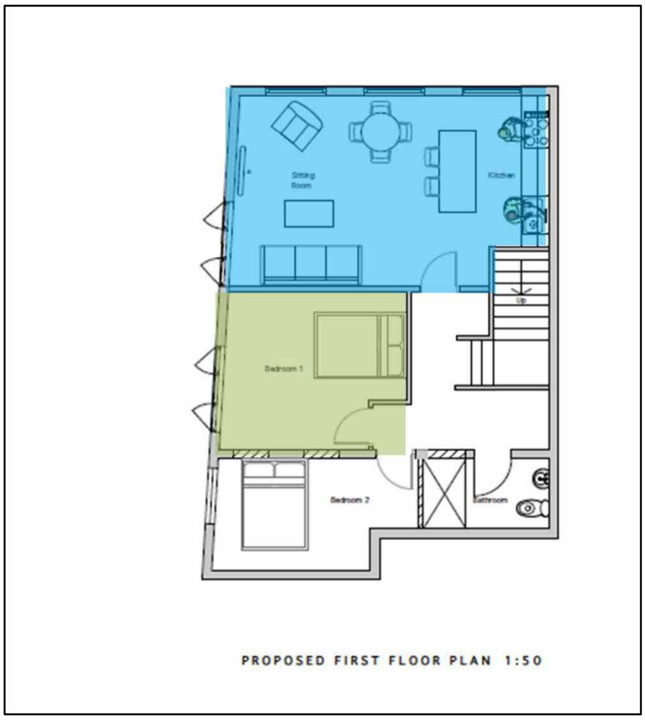


Fig. 3: First floor assessed living room shaded blue, assessed bedroom 1 shaded green.

5. Environmental Measurements

5.1. Ambient noise levels were measured at P1 between 10:40 and 11:40 on 18th January and at P2 between 15:00 on the 18th and 10:00 on the 23rd January 2024 respectively. P1 and P2 are shown in Table 2 below.

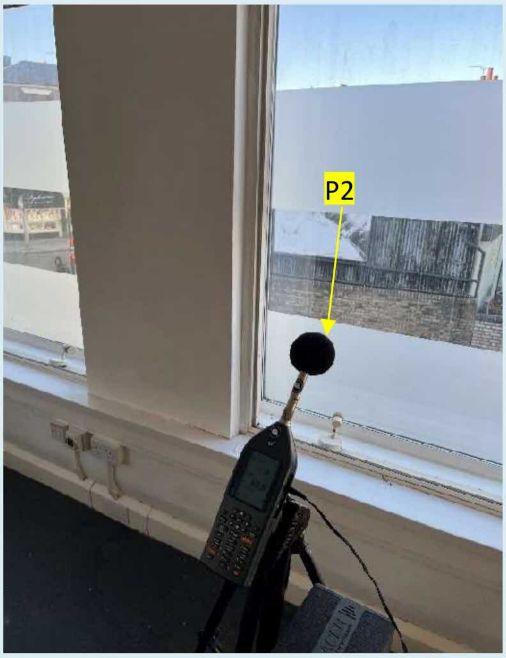
Location	Photo	Noise Sources
P1 1.0m above the ground, 2m back from Station Road West in line with the first-floor façade		Local road traffic (Station Road West), junction crossing, traffic lights walk signal and footfall
P2 1.3m above the first floor, 1m from the sealed front window		Local road traffic (Station Road West), junction crossing, traffic lights walk signal and footfall

Table 2: Environmental Monitoring Locations

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5.2. The measurements were taken at P1 and P2 using NOR 140 sound level meter serial number 1407786 which has been calibrated at a UKAS accredited laboratory within the last two years – calibration certificate is available upon request. The sound level meter was field calibrated with a Norsonic 1255 acoustic calibrator serial number 25754 to 114dB. The field calibrations were within the accepted tolerance of 0.5dB for environmental sound measurements.

5.3. The sound level meter was set up to measure in 5min periods at P1 and 1hr periods at P2.

5.4. The weather during the manned monitoring on 18th January 2024 was cold, dry with a light breeze. The weather during the unmanned monitoring between 18th – 23rd January 2024 was not of significance as the monitor was set up indoors, however it was noted there were strong winds on 21st and 22nd January and patchy light showers on 22nd January 2024.

5.5. Table 3 shows the logarithmic average of the overall $L_{Aeq,5min}$ and $L_{eq,5min}$ 1/1 octave band data for the measurements between 10:40 and 11:40 on the 18th January 2024 at P1.

Location	dBA	1/1 octave band centre frequencies in Hz						
		63	125	250	500	1k	2k	4k
P1	70	72	69	66	65	66	64	59

Table 3: 1/1 Octave Band Data at P1 in dB

5.6. The daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ ambient noise levels measured at internally at P2 are shown below.

Measurement Location	Date	Daytime 07:00 – 23:00 $L_{Aeq,16hr}$ in dB	Date	Night-time 23:00 – 07:00 $L_{Aeq,8hr}$ in dB
P2	18th January	40	18th/19th January	35
	19th January	41	19th/20th January	33
	20th January	41	20th/21st January	34
	21st January	39	21st/22nd January	34
	22nd January	41	22nd/23rd January	33
	Log Average	**41**	**Log Average**	**34**

Table 4: P2 Ambient Noise Levels in dB

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6. BS 8233 Assessment

6.1. The site, adjacent to the road and a side passageway providing access to flats to the rear, did not allow for a semi-permeant monitor to be set up. To calculate the ambient and maximum IANL for bedroom 1 at night, dBC used the noise levels measured at P1, shown in Table 5 above. The levels were subject to distance attenuation and screening to determine external noise levels outside bedroom 1. The existing 4-20-4 double glazing will be kept in place following conversion.

6.2. Using the measured daytime noise levels at P1 provided a robust and worst case scenario assessment. The traffic stopped for the lights adjacent to the monitor in the centre of the building so the stopping, idling and setting off affected the levels. Bedroom 1 is located further from the lights and on a different façade. The measured IANL at P2 showed the noise levels reduced significantly at night.

Bedroom 1

6.3. dBC used a simplified model to determine the ambient and maximum noise level outside the bedroom 1 window. Table 5 shows the ambient and maximum noise levels to be used in the assessment.

Parameter	dBA	1/1 octave band centre frequencies in Hz						
		63	125	250	500	1k	2k	4k
L_{eq}	59	31	39	44	50	55	54	48
L_{max}	65	42	53	53	56	61	59	55

Table 5: Bedroom 1 external noise levels in dB

6.4. The bedroom dimensions were as follows:

Bedroom 1 size 4mL x 4mW x 2.4mH windows 2m^2

6.5. dBC has assumed a standard roof and double leaf external wall construction.

6.6. The minimum sound reduction indices (*R*) of the building products used in the bedroom 1 assessment are shown in Table 6.

Element	R_w	Sound Reduction Index, *R* 1/1 octave band centre frequency between 63Hz and 4kHz						
		63	125	250	500	1k	2k	4k
Standard External Wall	50	28	34	41	45	54	58	58
Standard Roof	40	23	28	34	40	45	49	49
4-20-4 Double Glazing	28	20	24	20	25	35	38	35

Table 6: Sound Reduction Indices, *R* in dB

6.7. Using the data in Table 5, the IANL was determined by calculation to be L_{Aeq} 28dB using the daytime noise levels. This is below the BS 8233 criteria of $L_{Aeq,8hr}$ 30dB and likely to be lower than 28dB(A) given the lower external noise levels at night.

6.8. The determined maximum noise level, L_{Amax} inside bedroom 1 was 37dB. This is below the Mid Suffolk District Council and Pro PPG L_{Amax} 45dB criteria and likely to be lower than 37dB(A) given the lower external noise levels at night.

Living Room/Kitchen

6.9. At P2 the daytime IANL was 41dB(A). To ensure compliance with BS 8233 acoustic criteria of 35dB(A) the front façade sound insulation should be increased by a minimum of 6dB.

6.10. The existing three large windows on the front façade will remain in place and sealed. Therefore, the sound insulation should be increased by secondary glazing. dBC recommend 6mm laminated glazing fitted in the existing frame with a minimum gap of 30mm and maximum gap of 40mm from the existing glazing. Exceeding the 40mm gap significantly impacts the low frequency (63Hz) sound reduction of the glazing.

6.11. Table 7 shows the minimum glazing specification to be used for the front façade.

Element	R_w	Sound Reduction Index, *R* 1/1 octave band centre frequency between 63Hz and 4kHz						
		63	125	250	500	1k	2k	4k
4-20-4 Double Glazing plus 6mm laminate as secondary glazing 4-20-4-30-6(lam)	42	25	20	31	42	50	51	56

Table 7: Minimal glazing specification (front façade) in dB

6.12. The enhancement of the front façade sound insulation with secondary glazing as specified in Table 9 will reduce the IANL to 35dB(A) and meet the BS 8233 acoustic criteria.

6.13. Furthermore, given the glazing to the front façade will remain non-opening when the secondary glazing is installed will significantly reduce any noise from surrounding commercial activity such as conversation and entertainment noise from the Queens Head beer garden across the road.

Ventilation

6.14. The front façade glazing will be non-opening, the existing bedroom windows will be openable but do not have trickle ventilators installed. Therefore, background ventilation that forms part of the ventilation scheme for the dwelling can be provided by inwall ventilators in the side walls or installing trickle ventilators in the bedroom windows retrospectively. The vents must have the minimum level difference values shown in Table 8.

Element	$D_{n,e,w}$	Normalized Level Difference $D_{n,e}$ 1/1 octave band centre frequencies						
		63	125	250	500	1k	2k	4k
Greenwood 5000 EAW.AC2 Trickle ventilators	37	33	42	40	36	48	53	56
Rytons AAC5 Inwall ventilators	39	35	43	35	33	47	60	65

Table 8: Background ventilator specifications in dB

6.15. Background ventilation should not be confused with opening windows for rapid ventilation or to prevent overheating. The bedroom glazing should remain fully openable.

6.16. **dBC are not ventilation experts so it is essential that a full ventilation scheme will be advised by others to ensure the dwellings have sufficient ventilation to meet Building Regulations.**

7. Glossary of Acoustic Terminology

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter can be used to duplicate the ear's variable sensitivity to sound across a spectrum of frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the average ear. This is called an "A-weighting filter". Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

$L_{eq,T}$

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level Leq. The Leq is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period (T).

$L_{10,T}$

This is the minimum level exceeded for not more than 10% of the time period (T). This parameter is often used as a "not to exceed" criterion for noise.

$L_{90,T}$

This is the minimum level exceeded for not more than 90% of the time period (T). This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{fmax}

This is the maximum sound pressure level that has been measured over a period using a fast time constant.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combine, on a logarithmic scale, to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 3 identical sources produce a 5dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed, and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.